FINAL ADDENDUM TO ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE APPALACHIAN ELKTOE

September 2002

INTRODUCTION

In February 2001, the U.S. Fish and Wildlife Service (the Service) proposed designation of critical habitat under the Endangered Species Act of 1973, as amended (the Act) for the Appalachian elktoe (*Alasmidonta raveneliana*) on portions of 11 rivers in North Carolina and Tennessee. Because the Act also calls for an economic analysis of the critical habitat designation, the Service released a *Draft Economic Analysis of Critical Habitat Designation for the Appalachian Elktoe* (hereafter *DEA*) for public review and comment in April 2002.[1]

The primary purpose of this addendum is to update the *DEA* to address issues raised in public comments to the *DEA*, where appropriate, and to incorporate additional information received through personal communications with Action agencies and other stakeholders. As such, the Addendum considers newly available information and revisits the assumptions and analytic conclusions presented in the *DEA* in light of this new information.

REVISIONS TO THE DRAFT ECONOMIC ANALYSIS

The following sections describe the implications of, and responses to, public comments to the *DEA*. Additionally, certain topics addressed in the analysis were revisited and additional data gathered. Section numbers presented in the headers of this Addendum refer to the section numbers of the *DEA*.

SECTION 2 RELEVANT BASELINE INFORMATION

2.1 Socioeconomic Profile of the Critical Habitat Areas

Several of the comments received on the *DEA* addressed the characterization of the economic and demographic information for Mitchell County, North Carolina. Specifically, the commenters stated that the socioeconomic profile overlooked the importance of the mining industry in Mitchell County and stated that mining is "among the top three present employers" and the county's "major private employer."[2] This Addendum revises the socioeconomic profile for Mitchell County, North Carolina to reflect the data provided during public comment and personal communications with

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[1] Copies of the *Draft Economic Analysis of Critical Habitat Designation for the Appalachian Elktoe* are available by writing to the Field Supervisor, U.S. Fish and Wildlife Service, Asheville Field Office, 160 Zillicoa Street, Asheville, NC 28801.

[2] Comment Letter from the Mitchell County Board of Commissioners, June 17, 2002; Comment Letter from the Feldspar Corporation, June 4, 2002.

Action agencies and other stakeholders.

2.1.8 Mitchell County, North Carolina

Parts of the Toe River and the Nolichucky River proposed for designation are located in Mitchell County, North Carolina. Mitchell County's 2000 population was 15,687 accounting for 0.2 percent of the State total. This population is spread over 221 square miles with an average density of 74 people per square mile. Since 1990, the county's population has increased by 8.7 percent, which is less than the average rate of growth for the State of North Carolina as a whole (21.4 percent) over this ten year period.[3]

In 1999, Mitchell County had a total personal income (TPI) of about $303 million. This TPI ranked 88th in the State of North Carolina and accounted for 0.1 percent of the State total. Mitchell County's per capita personal income (PCPI) in 1999 was $20,519 and ranked 65th in the State. This PCPI is 22 percent lower than the State average of $26,417, and 28 percent lower than the national average of $28,546. Total earnings of persons employed in Mitchell increased from about $108 million in 1989 to $176 million in 1999, an average annual growth rate of 5.1 percent. The largest employment sectors in Mitchell County in 1999 were services, durable goods manufacturing, and State and local government. Exhibit 2-1 provides the largest employment sectors in Mitchell County in 2000.[4]

[3] U.S. Census Bureau, "State and County QuickFacts: Mitchell, North Carolina, 2000," http://quickfacts.census.gov/qfd/states/37/37199.html.

[4] U.S. Census Bureau, "2000 County Business Patterns, Mitchell, North Carolina," http://censtats.census.gov/cgi-bin/cbpnaic/cbpset.pl

Exhibit 2-1 Major Employment Sectors Mitchell County, North Carolina		
Employment Sector	**Number of Employees (for week including March 12)**	**Annual Payroll ($1,000)**
Manufacturing	1,673	$106,379
Retail Trade	918	$14,288
Health Care	797	$16,906
Accommodation & Food Services	288	$3,399
Construction	261	$5,898
Admin., support, waste management, remediation services	245	$4,351
Transportation and Warehousing	165	$5,120
Education	100	$1,958
Mining	20-99	not reported
Arts, entertainment and recreation	20-99	not reported

SECTION 3 IMPACTS

The following section presents an expanded discussion of the potential impact to the mining industry associated with both the listing of the elktoe and subsequent designation of critical habitat for this species. The time period over which these impacts are considered is 10 years.

Section 3.4 Mining

The *DEA* assumed that mining operations are subject to State-issued NPDES permits and that EPA does not take an active role in permitting unless State-issued permits violate State and Federal water quality standards, or wastewater discharges violate the limits set in the NPDES permits. Additionally, the Service typically does not consult on mining operations under section 7 in cases in which the wastewater discharges fall within the limits prescribed by the relevant NPDES permit.[5]

[5] Personal Communication with Biologist, Asheville Fish and Wildlife Office, U.S. Fish and Wildlife Service, North Carolina, November 16, 2002 and July 29, 2002.

Several commenters expressed concern that the proposed critical habitat designation for the Appalachian elktoe would disrupt the mining industry, resulting in job losses in Mitchell County, an already economically depressed area. However, a number of commenters, including the North Carolina Mining Association and the Feldspar Corporation, confirmed the assumption that wastewater discharges from mining activities are subject to State oversight, and thus are not expected to result in consultation with a Federal Action agency or the Service.[6] Even if mining activities were subject to consultation, the North Carolina Mining Association does not anticipate the implementation of any additional requirements beyond what would be required under the listing of the elktoe.[7] Public comments provided on mining impacts support the approach taken in the *DEA* that section 7 protection for the elktoe is unlikely to impact mining activities in the area surrounding proposed critical habitat for this species.

SECTION 5 POTENTIAL BENEFITS OF PROPOSED CRITICAL HABITAT

Several of the comments received on the *DEA* addressed the failure of the *DEA* to address the benefits associated with the designation of critical habitat for the elktoe. These comments range from statements that the economic benefits of the proposed critical habitat designation must be considered and quantified[8] to comments quantifying the economic benefits to the elktoe from the proposed critical habitat designation.[9] Specifically, the Southern Appalachian Biodiversity Project states that "readily available information *can* provide an indication of the relative benefits and costs associated with various "uses" of the endangered species and its associated habitat" and that "there are many significant benefits that have been ignored altogether by the Fish and Wildlife Service and INDUSTRIAL ECONOMICS, Inc., or erroneously assumed to be zero, when, in fact, they are likely

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[6] Comment Letter from Mitchell County Board of Commissioners, June 17, 2002; Comment Letter from North Carolina Mining Association, June 7, 2002; Comment Letter from the Feldspar Corporation, June 4, 2002; Personal Communication with representative from Feldspar Corporation, July 30, 2002; Personal Communication with representative from Mitchell County Board of Commissioners, July 30, 2002.

[7] Comment Letter from North Carolina Mining Association, June 7, 2002.

[8] Comment Letter from Cynthia McKinney, U.S. Congress, House of Representatives, May 22, 2002; Comment Letter from Powell Foster, May 30, 2002.

[9] Comment Letter from Marty Bergoffen, Southern Appalachian Biodiversity Project, June 4 and 6, 2002; Comment Letter from Karyn Moskowitz, Southern Appalachian Biodiversity Project, July 1, 2002.

to be quite substantial."[10] The Southern Appalachian Biodiversity Project then goes on to list several economic methods for measuring the magnitude of socioeconomic effects that may result from damage to critical habitat and provides specific analyses to "show that the benefits of critical habitat designation can be expressed in economic terms."[11] This Addendum revises the benefits sections of the *DEA* to address the comments provided by the Southern Appalachian Biodiversity Project.

The published economics literature has documented that real social welfare benefits can result from the conservation and recovery of endangered and threatened species (Bishop (1978, 1980), Brookshire and Eubanks (1983), Boyle and Bishop (1986), Hageman (1985), Samples *et al.* (1986), Stoll and Johnson (1984). Such benefits have also been ascribed to preservation of open space and biodiversity (see examples in Pearce and Moran,1994 and Fausold and Lilieholm,1999), both of which are associated with species conservation. Likewise, regional economies can benefit from the preservation of healthy populations of endangered and threatened species, and the habitat on which these species depend.

The primary goal of the Act is to enhance the potential for species recovery. Thus, the benefits of actions taken under the Act are primarily measured in terms of the value the public places on species preservation (e.g., avoidance of extinction, and/or an increase in a species' population). Such social welfare values may reflect both use and non-use (i.e., existence) values. For example, use values might include non-consumptive recreational use of a species (i.e., viewing opportunities), or the potential for consumptive uses should recovery be achieved. Non-use values are not derived from direct use of the species, but instead reflect the utility the public derives from knowledge that a species continues to exist.

In addition, as a result of actions taken to preserve endangered and threatened species, various other benefits may accrue to the public. Such benefits may be a direct result of modifications to projects made following section 7 consultation, or may be collateral to such actions. For example, a section 7 consultation may result in the requirement for buffer strips along streams, in order to reduce sedimentation due to construction activities. A reduction in sediment load may directly benefit water quality, while the presence of buffer strips may provide the collateral benefits of preserving habitat for terrestrial species and enhancing nearby residential property values (e.g., preservation of open space).

This chapter describes the benefits resulting from implementation of section 7 of the Act, in the context of areas affected by the proposed designation. It then discusses the extent to which existing valuation studies can be used to monetize these benefits. Finally, it discusses whether these benefits can be defined on a unit-by-unit basis, and whether these benefits attributable to critical

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[10] Id.

[11] Id.

habitat designation can be distinguished from all section 7 related benefits.

As discussed below, it is not feasible to fully describe and accurately quantify the benefits of this designation in the context of this economic analysis. The discussion presented in this report provides examples of potential benefits, which derive primarily from the listing of the species, based on information obtained in the course of developing the economic analysis. It is not intended to provide a complete analysis of the benefits that could result from section 7 of the Act in general or critical habitat designation in particular. *Given these limitations, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.*

5.1 Categories of Benefits

Implementation of section 7 of the Act is expected to substantially increase the probability of recovery for the elktoe. Such implementation includes both the jeopardy provisions afforded by the listing, as well as the adverse modification provisions provided by the designation. Specifically, the section 7 consultations that address the elktoe will assure that actions taken by Federal agencies do not jeopardize the continued existence of the elktoe or adversely modify its habitat. Note that these measures are separate and distinct from the section 9 "take" provisions of the Act, which also provide protection to this species.

The benefits of critical habitat designation can therefore be placed into two broad categories: those associated with the primary goal of species recovery, and those that derive mainly from the habitat protection required to achieve this primary goal. In the case of the elktoe, habitat protection provides for a variety of environmental benefits, including:

- **Decreased sedimentation and decreased turbidity** resulting from erosion control measures, maintenance of minimum flows, and habitat protection, restoration, and enhancement projects.

- **Stable water volume, flow, and depth** resulting from erosion control measures and maintenance of minimum flows.

- **Stable water temperature** resulting from maintenance of minimum flows.

- **Decreased habitat loss** resulting from erosion control measures, maintenance of minimum flows, habitat protection, restoration, and enhancement projects.

- **Decreased chance of isolation of fish host species and mussel species** resulting from installation of fish passageways.

- **Substitute habitat (mitigation)** resulting from habitat protection, restoration, and enhancement projects.

Exhibit 5-1 details those activities expected to generate section 7 consultations leading to project modifications associated with the proposed critical habitat for the elktoe, organized by the category of physical/biological improvement expected to result from the project modification. Specifically, this exhibit identifies the physical/biological improvements expected to result from implementation of section 7 of the Act and existing baseline protections. As provided in the *DEA*, uncertainty exists in appropriately allocating the number and costs of certain project modifications between existing baseline regulations, such as the North Carolina Sedimentation Pollution Control Act and the Federal Power Act, and the implementation of section 7 of the Act. Therefore, to most accurately portray the benefits to the elktoe that may result from implementation of section 7 of the Act, the "Allocation" column of exhibit 5-1 identifies whether each physical/biological improvement is expected to result solely from implementation of section 7 of the Act or jointly with existing baseline protections. Since comments on the *DEA* did not affect the *DEA's* analysis of the magnitude of the expected costs of this designation, the number of expected consultations has not changed.[12]

For example, it is expected that 38 to 50 consultations will result in project modifications providing for stable water quality, flow rates and depths. These are expected to result from consultations regarding road and bridge construction (18 to 23 consultations), hydropower relicensing (9 consultations), and residential development (11 to 18 consultations), spread across all six proposed critical habitat units. These consultations will be conducted under both the section 7 listing provisions (i.e., jeopardy), as well as the section 7 critical habitat related provisions (i.e., adverse modification), and thus are not solely attributable to the proposed designation. Note that estimates of future consultations provided in Exhibit 5-1 are conservative (i.e., more likely to overstate than understate the true number of project modifications that could result from Section 7 requirements associated with the elktoe). For example, forecast modifications to hydro-power projects may, in fact, have been required under the Federal Power Act in the absence of section 7.

The physical/biological improvements listed in Exhibit 5-1 may in turn provide for a variety of economic benefits. For example, reduced sedimentation and turbidity may improve fish populations, resulting in improved recreational fishing opportunities. The discussion below provides qualitative descriptions of the economic benefits associated with these environmental improvements. As noted, while it is possible to estimate the number of projects that will generate consultations requiring project modifications, existing data do not allow for quantification or monetization of the ecological implications of these requirements.

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[12] *DEA*, pp. 44-54.

5.1.1 Benefits Associated with Species Recovery

Use Value

The value that the public holds for species preservation may include a direct use component related to viewing opportunities. However, valuation research in this area has generally focused on more conspicuous terrestrial species. Similarly, individuals may value species preservation to the extent that it increases the probability of future consumptive use. This is unlikely to be significant in the case of the elktoe given little to no historical recreational harvest.

Freshwater mussels have historically been used for a variety of commercial purposes. Notably, in the late 19th century mussel shells were harvested to create "pearl buttons" for shirts. This trade ended with the development of synthetic substitutes. In more recent years, freshwater mussels were harvested in the U.S. to provide a feedstock for the cultivated pearl industry. Significant numbers of mussels were harvested in the South (including Tennessee and North Carolina) to support this export industry; in fact, harvest in some states rose to a level that threatened mussel populations (both those species that were the target of the harvest effort as well as those simply impacted by harvest activities). Restrictions on freshwater mussel harvests to protect all mussel species are now in effect in many states, including North Carolina and Tennessee.

While freshwater mussels provide some commercial economic benefit, the shell of the elktoe does not have the characteristics valued by the pearl industry. As such, it was not commercially harvested historically.[13] In addition, this species' population is not expected to recover sufficiently in the foreseeable future to allow for commercial exploitation. Furthermore, critical habitat will likely result in limits on commercial harvest of other mussel species in the areas of the designation. Thus, commercial benefits are not expected to result in the foreseeable future from the recovery of the elktoe.

Existence Value

A number of published studies have demonstrated that the public holds values for endangered and threatened species separate and distinct from any expected direct use of these species (i.e., a willingness to pay to simply assure that a species will continue to exist). These studies include Boyle and Bishop (1987), Elkstrand and Loomis (1998), Kotchen and Reiling (2000), and Loomis and White (1996). While the public's willingness to pay for preservation and enhancement of a wide-range of species has been studied, no studies have addressed the non-use values associated with endangered and threatened freshwater mussel species. Thus, it is not possible to develop a monetary measure of this category of benefit.

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[13] Personal Communication with Don Hubbs, Tennessee Wildlife Resources Commission, July 24, 2002.

5.1.2 Benefits Associated with Habitat Protection

As noted above, habitat preservation provides for a range of economic benefits, as discussed below.

Sport Fishing

Designation of critical habitat for the elktoe may result in improved recreational fishing opportunities, given improved water quality and habitat. That is, recreational anglers may benefit from enhanced catch rates, a broader range of target species, and improved stream aesthetics. Associated benefits could include an increase in tourism and recreation-industry jobs and expenditures in areas of the designation. However, no data exist to quantify the extent of the improvement expected in area fisheries, and thus no monetization of this benefit category can be made.

Other Recreation Benefits

In addition to the long-term potential for improvements in regional sport fisheries, protecting critical habitat for this species may result in preservation of habitat suitable for other recreational uses, such as hunting, hiking, boating and swimming. Conservation of various habitats may in turn lead to increased tourism and contribute to the expansion of a tourist economy in certain counties.[14] In addition, such activities are likely to generate social welfare benefits to recreators. Quantification of these benefits, however, is limited by the same information constraints as discussed above. For example, to estimate the extent to which whitewater rafting opportunities will improve requires an understanding of the extent to which this activity is limited by current flow rates and water quality (e.g., modest changes in sedimentation may not result in a change in the experience of this category of recreationalist). Data on the expected environmental change are not available.

Overall Ecosystem Health

Freshwater mussels are an integral part of the ecosystems in which they live. Protecting the primary constituent elements for the elktoe, including preserving water quality and natural flow regimes, will benefit other organisms that cohabit these areas. Each one of these organisms may in turn provide some level of direct or indirect benefit to the public and local economies.

Understanding the change in aquatic ecosystem health resulting from this designation would entail significant effort to model the likely changes in water quality as well as the ecological benefits of modified flow regimes. While these benefits can be described qualitatively, existing data are not

[14] Of course, if designation of critical habitat somehow constrains these activities these constraints will be manifest as a cost of the designation.

available to quantify the scale of these changes, such as required for monetization. For example, it is widely understood that reduced sedimentation in a river system can benefit various fish, shellfish, and aquatic plant communities. In addition, in some cases reductions in sedimentation may provide direct economic benefit (e.g., reducing the need for, or scale of, dredging operations). Quantifying these changes would, however, require additional information on the make-up of these aquatic communities and the baseline state of environmental quality. More importantly, such quantification would require detailed information on the nature and scope of project modifications resulting from section 7. Such information is not currently available due to the uncertainty about the modifications potentially associated with future projects.

Water Quality Benefits

Measures undertaken to protect elktoe habitat could lead to a variety of water quality benefits including: (1) protection of human drinking water supplies; (2) reduced cost of drinking water treatment; and (3) reduced cost of future stream restoration/maintenance activities. Again, quantification and monetization of these categories of benefits would require additional, detailed information on the scope and location of expected project modifications. For example, reductions in sediment load may reduce the cost of filtering municipal water supplies. The extent to which this category of benefits will be experienced, however, will depend on the location of the water systems, and the manner in which they operate (e.g., whether they utilize an instream water intake structure, or other system not impacted by sediment load).

Other Benefits

Additional benefits of designating critical habitat for the elktoe may include educational/informational benefits (increased awareness by the public of the extent of elktoe habitat), increased support for existing conservation efforts, and reduced uncertainty regarding the extent of elktoe habitat. For example, critical habitat designation will provide a firm legal definition of the extent of elktoe habitat, which may reduce regulatory uncertainty. At this time sufficient information does not exist to quantify or monetize the benefits of this designation, and thus it is not possible to present monetized benefits on a unit-by-unit basis.

5.2 Review of Previous Efforts to Place Monetary Values on the Benefits of Section 7 Implementation for the Elktoe

The Southern Appalachian Biodiversity Project ("Moskowitz") provided comments on the *DEA*, including an analysis of the extent to which the benefits of the proposed designation can be monetized.[15] Specifically, these comments contain an assessment that purports to "show that the benefits of critical habitat can be expressed in economic terms."[16] The analysis presented, however, is severely flawed. In particular, it fails to apply existing benefits estimates in a manner consistent with the federal guidelines and theoretical literature cited as the basis for the analysis (e.g., Unsworth and Petersen, U.S. Water Resources Council (1979 and 1983), Freeman (1993)).

The principal flaws in the Moskowitz analysis are described below.

1. The analysis fails to link any of the economic values presented to specific changes in environmental quality. For example, while values are presented associated with the preservation of forest land, no information is provided to indicate the degree to which forest land will be preserved as a result of the designation, or the scale or location of such actions. In addition, even if project modifications were expected to result in additional protections for forest land located near critical habitat, the analysis fails to recognize that timber harvests might simply occur elsewhere to meet regional demand.

2. Related to the first point above, the analysis fails to assess the marginal effects of the requirements of section 7, and instead focuses on total resource values. For example, while estimates of the total value of water assured by protection of National Forests may be relevant in some policy settings, it is not useful for understanding the net social costs of critical habitat designation.[17]

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[15] Moskowitz, Karyn, "Comments on the Draft Economic Analysis for Critical Habitat Designation of the Appalachian Elktoe," Southern Appalachian Biodiversity Project, July 1, 2002.

[16] Ibid.,12.

[17] The analysis also provides detailed data on the overall role of nature-based tourism in this region. Such broad regional measures of total economic activity, however, have no relevance to the small changes predicted to take place due to the designation. In addition, such analysis would need to incorporate an understanding of the availability of substitutes for activities affected by section 7 related project modifications.

3. The analysis presented fails to follow the standard, well accepted practices of benefits transfer. Benefits transfer is the method used by economists to apply the results of existing valuation studies to a new policy question. For example, the economics literature provides a large number of studies that define the economic surplus associated with recreational fishing trips. These studies are commonly used to predict the value of a fishing day at a site that has not been studied, given various attributes of that site (e.g., species of fish, demographics of the local community, etc.).[18] Two core principles of defensible benefits transfer are (1) the use of studies that apply acceptable techniques to generate welfare values, and (2) similarity between the good being valued in the literature and the good being valued in the policy context to which the transfer is being made. The Moskowitz analysis fails to provide a review of the quality of the studies relied on, or their relevance to the policy question at hand. For example, use of Haelfele et al. (1992), developed to understand the value the public places on protection of spruce-fir forest stands from air pollution, is not applicable in the context of valuing the preservation of bottom-land hardwoods. For example, Haefele attempts to value different forest quality in high elevation spruce-fir forest, by assessing participants' willingness to pay to protect and enhance aesthetic quality. In contrast, the buffer zones relevant to the proposed critical habitat designation generally include hardwoods, hemlock, and adjacent riparian areas with inherently different ecological characteristics and species composition.[19]

4. The analysis mixes economic welfare (i.e., consumer surplus) measures of economic performance with measures of regional economic performance. Such estimates must be presented separately, and cannot be summed to obtain measures of total economic impact. In addition, the analysis as presented risks double counting of economic effects.

For a benefits transfer to be conducted that accurately measures the economic benefits of critical habitat designation, the analysis would first need to start with an understanding of the physical and biological changes in environmental quality expected to result from project modifications required as a result of section 7 consultation. For example, consideration of the economic benefits associated with reduced sedimentation would require information on the reduction in the quantity of sediment load, as well as the geographic location of the activity requiring modification. As discussed in detail above, such data are not currently available, and thus preclude the development of monetary measures of benefit.

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[18] For more discussion of benefits transfer, see Environmental Protection Agency, *Guidelines for Preparing Economic Analyses* (EPA 240-R-00-003), September 2000.

[19] Personal Communication with Doreen Miller, Wildlife Biologist, USDA Forest Service, July 25, 2002.

5.3 Assigning Benefits on a Unit-by-Unit Basis and to the Critical Habitat Designation

Where possible, the benefits of critical habitat designation should be described on a unit-by-unit basis, and distinguished from the benefits that result from implementation of the jeopardy provisions of section 7 of the Act. The benefits discussed above arise primarily from the protection afforded to the elktoe under the section 7 jeopardy provisions. Specifically, *future consultations - and any associated project modifications - are expected to be primarily associated with the listing of the species (i.e., the jeopardy provision of section 7), rather than the critical habitat designation (i.e., the adverse modification provision).*

Exhibit 5-1

Physical/Biological Improvements Expected to Result from Implementation of Section 7 of the Act

Physical/Biological Improvement	Expected Project Modification	Nexus	Critical Habitat Unit	Number of Expected Consultations*	Breakdown of Consultations	Allocation
Decreased sedimentation	Erosion Control Measures[1] Maintenance of minimum flows Habitat protection, restoration, and enhancement projects	Road and Bridge Construction Hydropower Relicensing Residential Development	Unit 1 Unit 2 Unit 3 Unit 4 Unit 5 Unit 6	6-9 consultations 14-19 consultations 4 consultations 5-8 consultations 7-8 consultations 2 consultations	1 hydropower; 1 road; 4-7 development 4 hydropower; 3-4 roads; 7-11 development 3 hydropower; 1 road 1 hydropower; 4-7 roads 7-8 roads 2 roads	Baseline and section 7

Exhibit 5-1

Physical/Biological Improvements Expected to Result from Implementation of Section 7 of the Act

Physical/Biological Improvement	Expected Project Modification	Nexus	Critical Habitat Unit	Number of Expected Consultations*	Breakdown of Consultations	Allocation
Decreased turbidity	Erosion Control Measures Maintenance of minimum flows Habitat protection, restoration, and enhancement projects	Road and Bridge Construction Hydropower Relicensing Residential Development	Unit 1 Unit 2 Unit 3 Unit 4 Unit 5 Unit 6	6-9 consultations 14-19 consultations 4 consultations 5-8 consultations 7-8 consultations 2 consultations	1 hydropower; 1 road; 4-7 development 4 hydropower; 3-4 roads; 7-11 development 3 hydropower; 1 road 1 hydropower; 4-7 roads 7-8 roads 2 roads	Baseline and section 7

Exhibit 5-1

Physical/Biological Improvements Expected to Result from Implementation of Section 7 of the Act

Physical/Biological Improvement	Expected Project Modification	Nexus	Critical Habitat Unit	Number of Expected Consultations*	Breakdown of Consultations	Allocation
Stable water volume, flow, and depth	Erosion Control Measures Maintenance of minimum flows	Road and Bridge Construction Hydropower Relicensing Residential Development	Unit 1 Unit 2 Unit 3 Unit 4 Unit 5 Unit 6	6-9 consultations 14-19 consultations 4 consultations 5-8 consultations 7-8 consultations 2 consultations	1 hydropower; 1 road; 4-7 development 4 hydropower; 3-4 roads; 7-11 development 3 hydropower; 1 road 1 hydropower; 4-7 roads 7-8 roads 2 roads	Baseline and section 7
Stable water temperature	Maintenance of minimum flows	Hydropower Relicensing	Unit 1 Unit 2 Unit 3 Unit 4	1 consultation 4 consultations 3 consultations 1 consultation		Baseline and section 7

Exhibit 5-1

Physical/Biological Improvements Expected to Result from Implementation of Section 7 of the Act

Physical/Biological Improvement	Expected Project Modification	Nexus	Critical Habitat Unit	Number of Expected Consultations*	Breakdown of Consultations	Allocation
Decreased Habitat Loss	Erosion Control Measures Maintenance of minimum flows Habitat protection, restoration, and enhancement projects	Road and Bridge Construction Hydropower Relicensing Residential Development	Unit 1 Unit 2 Unit 3 Unit 4 Unit 5 Unit 6	6-9 consultations 14-19 consultations 4 consultations 5-8 consultations 7-8 consultations 2 consultations	1 hydropower; 1 road; 4-7 development 4 hydropower; 3-4 roads; 7-11 development 3 hydropower; 1 road 1 hydropower; 4-7 roads 7-8 roads 2 roads	Baseline and section 7
Decreased chance of isolation of fish host species and mussel species	Fish passageways	Hydropower Relicensing	Unit 1 Unit 2 Unit 3 Unit 4	1 consultation 4 consultations 3 consultations 1 consultation		Baseline

Exhibit 5-1

Physical/Biological Improvements Expected to Result from Implementation of Section 7 of the Act

Physical/Biological Improvement	Expected Project Modification	Nexus	Critical Habitat Unit	Number of Expected Consultations*	Breakdown of Consultations	Allocation
Substitute habitat (mitigation)	Habitat protection, restoration, and enhancement projects	Road and Bridge Construction	Unit 1 Unit 2 Unit 3 Unit 5 Unit 6	1 consultation 3-4 consultations 1 consultation 7 consultations 2 consultations		Section 7

* Note: This analysis assumes that any benefits from section 7 of the Act stem from the application of project modifications. Therefore, this analysis assumes that the projected number of consultations requiring project modifications most accurately represents the level of protection the elktoe may receive as a result of section 7 implementation.

[1] Erosion Control Measures may include one or more of the following: erosion and sedimentation plan; buffer zones; seeding/mulching; time-of-year restrictions; reduced paved road widths; elimination of curb and gutter; construction of rain gardens.

POTENTIAL IMPACTS OF PROPOSED CRITICAL HABITAT ON THE ENERGY INDUSTRY

Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effects" for all "significant energy actions." The purpose of this requirement is to ensure that all Federal agencies "appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[20] The Office of Management and Budget has provided guidance for implementing this executive order that outlines nine outcomes that may constitute "a significant adverse effect" when compared without the regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day;
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of 5 million tons per year;
- Reductions in natural gas production in excess of 25 million mcf
- Reductions in electricity production in excess of 1 billion kilowatts per year or in excess of 500 megawatts of installed capacity;
- Increases in energy use required by the regulatory action that exceed the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.[21]

Two of these criteria are relevant to this analysis: 1) reductions in electricity production in excess of 1 billion kilowatts per year or in excess of 500 megawatts of installed capacity and 2) increases in the cost of energy production in excess of one percent. Below, we analyze whether the electricity industry, and specifically, hydroelectric producers are likely to experience "a significant adverse effect" as a result of section 7 implementation for the elktoe.

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[20] Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, http://www.whitehouse.gov/omb/memoranda/m01-27.html

[21] Id.

Evaluation of Whether Section 7 Implementation will Result in a Reduction in Electricity Production in Excess of 500 Megawatts of Installed Capacity

Installed capacity is "the total manufacturer-rated capacity for equipment such as turbines, generators, condensers, transformers, and other system components" and represents the maximum rate of flow of energy from the plant or the maximum output of the plant.[22] Exhibit 6 lists the installed capacity of each of the hydropower projects likely to impact proposed critical habitat for the elktoe. Tapoco-APGI owns two dams, the Santeetlah Dam and the Cheoah Dam, that are located near proposed critical habitat for the elktoe. Nantahala Power and Light, a subsidiary of Duke Power, owns five hydropower projects that are either located in the area proposed as critical habitat or may affect proposed critical habitat for the elktoe: Franklin Dam, Dillsboro Dam, Bryson Dam, West Fork Project, and the East Fork Project.[23] The Tennessee Valley Authority operates the Fontana Dam on the Little Tennessee River. Although the Fontana Dam lies outside of the area proposed as critical habitat, it may affect the downstream extent of proposed elktoe habitat.[24]

The combined installed capacity for all eight hydropower projects is 445.48 MW (445,480 KW). As stated in the *DEA*, the relicensing of hydropower facilities is subject to the requirements of the Clean Water Act, Dam Safety Control Act and the Federal Power Act as well as implementation of section 7 of the Endangered Species Act. Therefore, hydropower facility owners/operators will need to consider the impacts of their actions on sensitive species, regardless of the implementation of section 7 of the Act. However, since it is difficult to separate the economic impacts associated with the baseline regulations from the requirement of section 7, the *DEA* made a conservation assumption that all of the costs for project modifications to hydropower facilities, except the costs for the installation of fish passageways, were attributed to implementation of section 7 of the Act. Even when viewed in the context of a worst-case scenario, in which implementation of section 7 of the Act results in significant operational changes to all eight hydropower projects, the total capacity is 445.48 MW (445,480 KW) of hydroelectricity, so the impact on these hydropower facilities could not exceed the 500 MW (500,000 KW) threshold.

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[22] California Power Plants, In-State Installed Capacity and Dependable Capacity, California Energy Commission, http://www.energy.ca.gov/electricity/capacity.html

[23] The East Fork and West Fork hydropower projects include multiple hydropower dams.

[24] The Cascade Power Plant has been decommissioned and is no longer operating. Therefore, this facility is not included in this energy impact analysis.

Exhibit 6

Installed Capacity of Hydropower Projects
Likely to Impact Proposed Critical Habitat for the Appalachian Elktoe

Name of Facility	Owner	Installed Capacity		Average Annual Generation
		MW	KW	1,000 KWhr
Santeetlah Dam	Tapoco-APGI	45	45,000	193,000
Cheoah Dam	Tapoco-APGI	110	110,000	500,000
Fontana Dam	Tennessee Valley Authority	238.5	238,500	910,000
Bryson Dam	Nantahala Power & Light (Duke Power)	0.98	980	6,500
Dillsboro Dam	Nantahala Power & Light (Duke Power)	0.225	225	1,400
West Fork Project	Nantahala Power & Light (Duke Power)	24.6	24,600	91,400
East Fork Project	Nantahala Power & Light (Duke Power)	26.175	26,175	93,500
Total		**445.48**	**445,480**	**1,795,800**

Source: Searches of Records and Information Management System (RIMS) on-line database by FERC Project numbers, Federal Energy Regulatory Commission, http://rimsweb1.ferc.gov/rims; Individual Conventional Developed and Undeveloped Hydroelectric Plants and Sites by Geographic Division, State, and Stream, Federal Energy Regulatory Commission

Evaluation of Whether Section 7 Implementation will Result in an Increase in the Cost of Energy Production in Excess of One Percent

In order to determine whether implementation of section 7 of the Act will result in an increase in the cost of energy production, this analysis considers the maximum possible increase in energy production costs under a scenario where the implementation of section 7 causes significant operational changes to all eight hydropower facilities and the resulting electricity demand is met through coal-fired facilities. Natural gas represents the next cheapest fuel source for generating electricity (hydropower is the cheapest) but also accounts for the smallest portion of electricity production, at roughly two percent. Nuclear-generated electricity accounts for approximately 33 percent of overall generation and represents the most expensive fuel source.[25] Electricity generated by coal-fired facilities makes up the largest portion of electricity generated in North Carolina and Tennessee, accounting for approximately 66 percent of overall production. Accordingly, professional judgment suggests that coal would be the likely fuel substitute for this electricity demand.[26] Exhibit 7 outlines the cost of energy production with the operation of the eight hydropower facilities. Exhibit 8 outlines the cost of energy production where the electricity demand is met through coal-fired facilities. Under this scenario, coal-fired facilities will experience $71,832,000 in additional costs which represents approximately a 0.67 percent increase in production costs.

Even in the worst case scenario, implementation of section 7 for the elktoe will not result in a "reduction in electricity production in excess of 500 megawatts of installed capacity" or an "increase in the cost of energy production in excess of one percent." Therefore, this rule will not have a significant adverse effect on the supply, distribution, or use of energy.

[25] Annual Energy Outlook 2002, Energy Information Administration, U.S. Department of Energy, December 2001.

[26] Id.

Exhibit 7

Average Production Costs with Hydropower Operations

Fuel Type	Net Generation KWhrs	Weighted Average	Production Costs cents/KWhr	Total Costs
Hydro	1,795,800,000	0.91%	$0.01	$17,958,000
Gas	1,877,563,000	0.95%	$0.04	$75,102,520
Coal	129,452,770	65.42%	$0.05	$6,472,638,500
Nuclear	64,750,729,000	32.72%	$0.07	$4,208,797,385
Total	197,887,162,000	99.09%		$10,774,496,405

Sources: Electric Power Annual 2000, Volume 1, Energy Information Administration, U.S. Department of Energy, August 2001, accessed at http://www.eia.doe.gov/cneaf/electricity/epav1/epav1.pdf; Annual Energy Outlook 2002, Energy Information Administration, U.S. Department of Energy, December 2001; Individual Conventional Developed and Undeveloped Hydroelectric Plants and Sites by Geographic Division, State, and Stream, Federal Energy Regulatory Commission; Personal Communication with Senior Engineer, Public Staff, North Carolina Utilities Commission; State Electricity Profiles, North Carolina, Energy Information Administration, U.S. Department of Energy, November 2001; State Electricity Profiles, Tennessee, Energy Information Administration, U.S. Department of Energy, November 2001; Average Operating Expenses for Major U.S. Investor-Owned Electric Utilities, 1995 Through 1999, http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t13pl.html

Exhibit 8

Average Production Costs without Hydropower Operations

Fuel Type	Net Generation KWhrs	Weighted Average	Production Costs cents/KWhr	Total Costs
Hydro	1,806,100,000	0.91%	$0.05	$89,790,000
Gas	1,877,563,000	0.95%	$0.04	$75,102,520
Coal	129,452,770	65.42%	$0.05	$6,472,638,500
Nuclear	64,750,729,000	32.72%	$0.07	$4,208,797,385
Total	197,887,162,000	99.09%		$10,846,328,405

Sources: Electric Power Annual 2000, Volume 1, Energy Information Administration, U.S. Department of Energy, August 2001, accessed at http://www.eia.doe.gov/cneaf/electricity/epav1/epav1.pdf; Annual Energy Outlook 2002, Energy Information Administration, U.S. Department of Energy, December 2001; Individual Conventional Developed and Undeveloped Hydroelectric Plants and Sites by Geographic Division, State, and Stream, Federal Energy Regulatory Commission; Personal Communication with Senior Engineer, Public Staff, North Carolina Utilities Commission; State Electricity Profiles, North Carolina, Energy Information Administration, U.S. Department of Energy, November 2001; State Electricity Profiles, Tennessee, Energy Information Administration, U.S. Department of Energy, November 2001; Average Operating Expenses for Major U.S. Investor-Owned Electric Utilities, 1995 Through 1999, http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t13pl.html

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